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ABSTRACT

A study sought to ascertain the effect, if any, exposure to different temperatures would have on an individual's ability to discriminate between different tactile stimuli. Ten young adult males were repeatedly subjected to emersion of their dominant hand in water ranging in temperature from ice, to 105 degrees Fahrenheit (F), in increments of 15 degrees F, and then asked to identify, without sight, 40 two-dimensional figures. The figures were cut out of different grades of sandpaper and embedded in a single course grade. Based upon the results of the analysis of collected data, it was concluded that the ability to accurately discriminate between different degrees of tactile stimuli was facilitated by temperatures above 60 degrees F, and adversely affected by temperatures below 60 degrees F. (JD)

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Thermal Variation and Tactile Discrimination in the Dominant Hand
By John J. Standring and C. Eric Gronbeck.

Introduction

Participants required to manipulate implements or objects have long been aware of the affect thermal variation has on the ability to differentiate between tactile stimuli. Football, baseball, golf and tennis are but a few activities which require "a feel" to perform successfully and in which players are subject to environmental temperature change. Many commercial items are available which have been designed to combat the affect of temperature variation, yet no evidence that this affect has ever been scientifically investigated seems to exist. It was the purpose of this study to ascertain what effect, if any, exposure to different temperatures would have on an individuals ability to discriminate between different tactile stimuli.

Procedures

Ten young adult males were repeatedly subjected to emersion of their dominant hand in water ranging in temperature from ice to 105⁰f, in increments of 15⁰f, and then asked to identify 40 two dimensional figures without the availability of sight. (See Figure 1) The figures were cut out of differement grades of sandpaper and embedded in a single course grade. The difference in stimuli varied from none to very great. (See Example 1) Each subject was tested for identification of four figures on ten cards

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assigned at random, equally inclusive of all testing possibilities. Five seconds were allotted in which to identify each figure. Testing followed five minutes of dominant hand immersion in the required temperature water, a treatment which was repeated for two minutes after the first five cards. All treatment temperatures were assigned at random. Temperature change was accomplished with ice and a microwave.

Statistical Analysis

Means were computed as measures of central tendency and standard deviations as measures of variability in quantitatively describing the data. (See Table 1) Inferences were based on a one-way analysis of variance with repeated measures over six thermal variations; 32°, 45°, 60°, 75°, 90°, and 105°. Tukey's HSD procedure was imposed post hoc to locate the significance indicated by the F ratio. The Alpha level was set at P..05 for all comparisons (See Table 2). To assist the reader means are plotted graphically (See Figure 2).

RESULTS

1. The mean correct identification of tactile discrimination following immersion in 32° water, 12.5, was significantly less than the mean correct identification in tactile discrimination following immersion in 75° water, 15.8.
2. The mean correct identification of tactile discrimination following immersion in 32° water, 12.5, was significantly less than the mean correct identification in tactile discrimination following immersion in 90° water, 18.9.
3. The mean correct identification of tactile discrimination following immersion in 32° water, 12.5, was significantly less than the mean correct identification in tactile discrimination following immersion in 105° water, 19.6.
4. The mean correct identification of tactile discrimination following immersion in 45° water, 13.8, was significantly less than the mean correct identification in tactile discrimination following immersion in 90° water, 18.9.
5. The mean correct identification of tactile discrimination following immersion in 45° water, 13.8, was significantly less than the mean correct identification in tactile discrimination following immersion in 105° water, 19.6.
6. The mean correct identification of tactile discrimination following immersion in 60° water, 13.5, was significantly less than the mean correct identification in tactile discrimination following immersion in 90° water, 18.9.

7. The mean correct identification of tactile discrimination following immersion in 60° water, 13.5, was significantly less than the mean correct identification in tactile discrimination following immersion in 105° water, 19.6.
8. The mean correct identification of tactile discrimination following immersion in 75° water, 15.8, was significantly less than the mean correct identification in tactile discrimination following immersion in 90° water, 18.9.
9. The mean correct identification of tactile discrimination following immersion in 75° water 15.8, was significantly less than the mean correct identification in tactile discrimination following immersion in 105° water, 19.6.

Conclusion

Based upon the results of the analysis of collected data and within the limitations of the investigation it was concluded that the ability to accurately discriminate between different degrees of tactile stimuli was facilitated by temperatures above 60°f, and adversely affected by temperatures below 60°f.

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TABLE 1
Treatment Means and Variances

Treatment	Mean	Standard Deviation
A (1) 32 ⁰	12.5	3.29
A(2) 45 ⁰	13.8	3.09
A (3) 60 ⁰	13.5	3.07
A (4) 75 ⁰	15.8	5.06
A (5) 90 ⁰	18.9	3.93
A (6) 105 ⁰	19.6	3.80

TABLE 2
Summary of the Analysis of Variance

Source	Sum of Squares	DF	Mean Squares	F
A	441.48	5	88.30	16.09*
S	606.48	9	67.39	
A x S	247.02	45	5.49	
Total	1294.98	59		

* Significant at .05

